



# Education, Training and Career Pathway Opportunities for Buildings Energy Efficiency Programs Within the Corps Network

Allison Moe

*National Renewable Energy Laboratory*

**NREL is a national laboratory of the U.S. Department of Energy  
Office of Energy Efficiency & Renewable Energy  
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National Renewable Energy Laboratory  
15013 Denver West Parkway  
Golden, CO 80401  
303-275-3000 • [www.nrel.gov](http://www.nrel.gov)

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## List of Acronyms

BBWA	Better Buildings Workforce Accelerator
BPA	Building Performance Association
BPI	Building Performance Institute
BSP	Building Science Principles
DOE	U.S. Department of Energy
HBI	Home Builders Institute
HEP	Home Energy Professional
HVAC	Heating, ventilating, and air conditioning
HVACR	Heating, ventilating, air conditioning, and refrigeration
JTA	Job Task Analysis
NABTU	North America’s Building Trades Unions
NASCSP	National Association for State Community Services Programs
NREL	National Renewable Energy Laboratory
OSHA	Occupational Safety and Health Administration
RAP	Registered Apprenticeship program
SMART	Sheet Metal, Air, Rail and Transportation
TCN	The Corps Network
WAP	Weatherization Assistance Program

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# 1 Introduction

The Corps Network (TCN) is a national association that represents more than 150 local organizations around the country that work to “transform young people’s lives and communities through career development, civic engagement, and conservation” (TCN 2022). These programs are referred to as Corps, and program participants are referred to as Corpsmembers. Corps operate in urban, suburban, and rural communities, executing projects that address recreation, conservation, disaster response, and other community needs (TCN).

Corps programs engage youth ages 16–30, as well as veterans up to the age of 35.<sup>1</sup> Corpsmembers commit to a minimum term of service, often one year, with a specific organization and program. During their term of service, they receive education, career-relevant and on-the-job skills training, and compensation in the form of stipends or living allowances. Corpsmembers in programs that receive funding through the AmeriCorps program are also eligible for education awards or scholarships when they complete their term (TCN 2022).

Through its partnership in the Better Buildings Workforce Accelerator, TCN requested technical assistance from the National Renewable Energy Laboratory (NREL) to support Corps organizations involved in—or interested in developing—programs related to energy efficiency in buildings (hereafter referred to as simply “energy efficiency”). The technical assistance consists of providing information on (1) careers and career pathways in energy efficiency, (2) knowledge, skills, and certifications recommended or required for those pathways, and (3) existing training programs and resources available for Corps. The goal of this project is to provide industry-recognized energy efficiency education/training models and resources that can be tailored and replicated by Corps across the country, and which can best prepare Corpsmembers to enter the energy efficiency workforce when they complete their terms of service.

## 1.1 Methodology and Project Scope

The scope of this project was crafted by NREL in coordination with TCN and a working group of eight Corps programs involved in energy efficiency in buildings. Although Corps programs share common missions, each one operates independently and has its own structure, partners, and industry focus areas based on many factors including organizational capacity and the local market. To ensure that this technical assistance would adequately address the variety of program types involved, the following parameters were identified for the major components of this project:

1. In Section 2, Careers in Energy Efficiency, information is kept broad to encompass a wide variety of possible jobs which Corpsmembers may be qualified for or interested in upon completion of their terms of service. Careers addressed include construction, manufacturing, and professional services for both new construction and retrofit work. Jobs data presented is national in scale and reflects industry-recognized occupational roles and titles. At the request of Corps programs from the working group, regional

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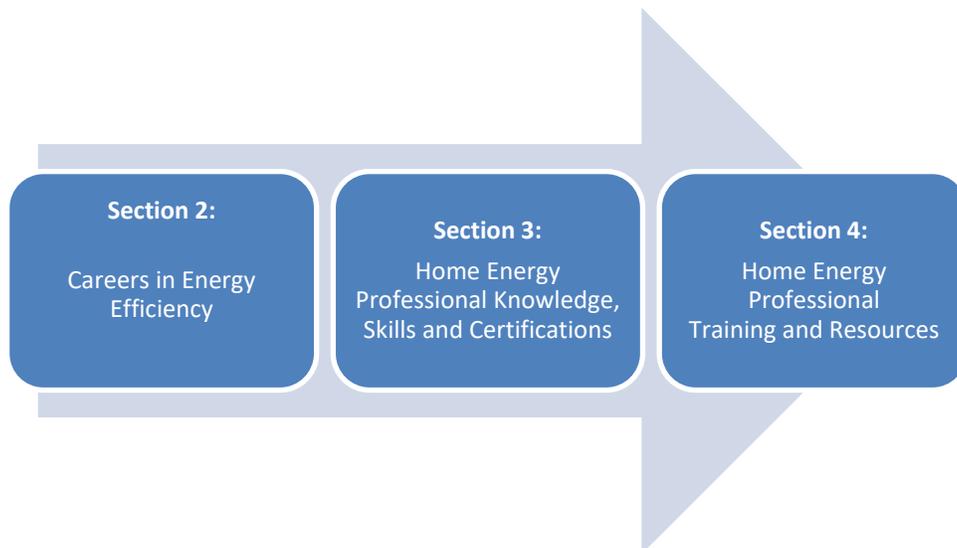
<sup>1</sup> It should be noted that some Corps programs are funded by Americorps, which does not have the same age and target population restrictions as Corps programs, as defined by TCN.

energy efficiency market analyses are included in Appendix B for three specific locations.

2. Section 3, Home Energy Professional (HEP) Knowledge, Skills, and Certifications, presents information on energy efficiency knowledge, skills, and certifications that are industry-recognized across the country. The purpose is to encourage consistency in program implementation across Corps programs, and help ensure that, to the extent possible, Corpsmembers receive not only valuable education and skills, but certifications that are portable across geographies.

The occupational focus of the section is narrowed to address only HEP career paths, which cover residential energy efficiency retrofit projects for existing homes. The focus was narrowed to HEP career paths for several reasons: first, because this is the type of work performed by the majority of Corps programs engaged or interested in energy efficiency. Second, it offers a clear and industry-recognized pathway. Third, HEP occupations (and the training and certification programs available to them) incorporate a wide variety of skills that are highly transferable to many of the other energy efficiency industry subsectors discussed in the previous section, such as heating, ventilating, and air conditioning (HVAC), insulation, carpentry, and others (Interstate Renewable Energy Council [IREC] 2022).

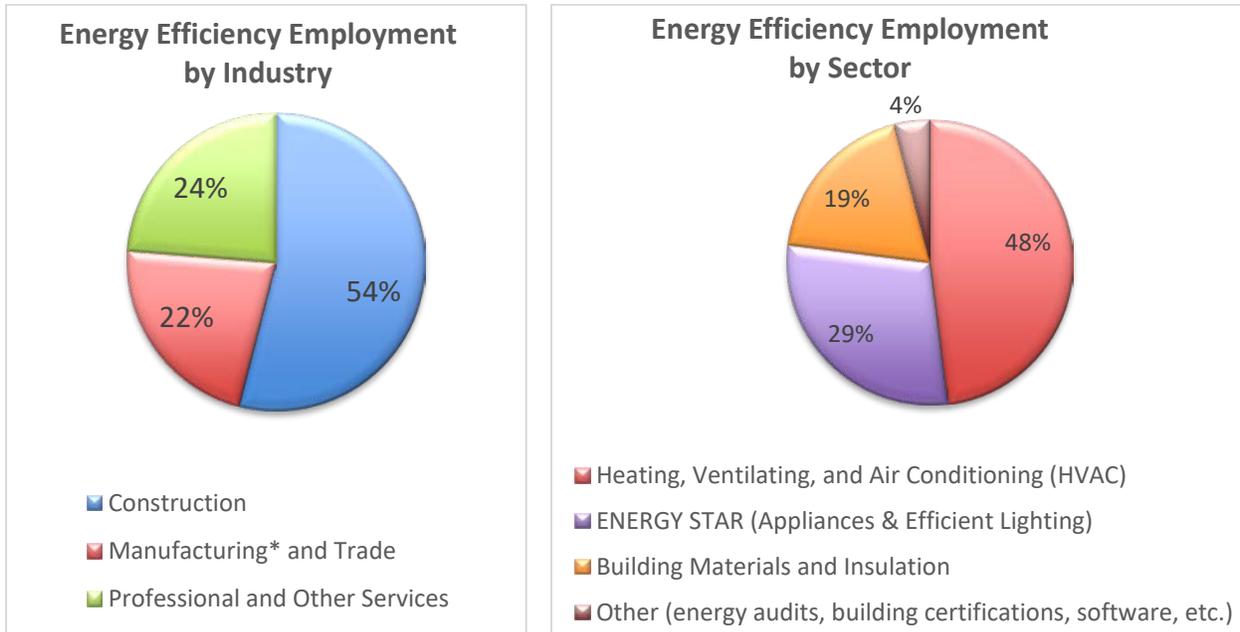
3. The final section, HEP Education and Training Resources, highlights specific education and training that can help TCN programs prepare their Corpsmembers for entry-level HEP job positions. This section presents a variety of resource types, including both in-person and online trainings, as well as industry-vetted resources that individuals Corps could adapt and customize to fit within their own organizational structure and preferences. Most of these resources were developed specifically for the Weatherization Assistance Program (WAP), a national low-income energy efficiency retrofit program for which the HEP job classifications and certifications were originally developed.



**Figure 1. Overview of scope by section**

## 2 Careers in Energy Efficiency

According to the most recent United States Energy & Employment Report, there are more than 2.1 million energy efficiency jobs in the United States (U.S. Department of Energy [DOE] 2022). A related analysis from 2021 found that these jobs could be found in more than 99% of counties (E4TheFuture 2021). These jobs are held by workers engaged in construction, manufacturing, and professional and other services who dedicate at least 50% of their time to energy efficiency in buildings. More detail on the types of occupations in each of these areas is provided in the next section.

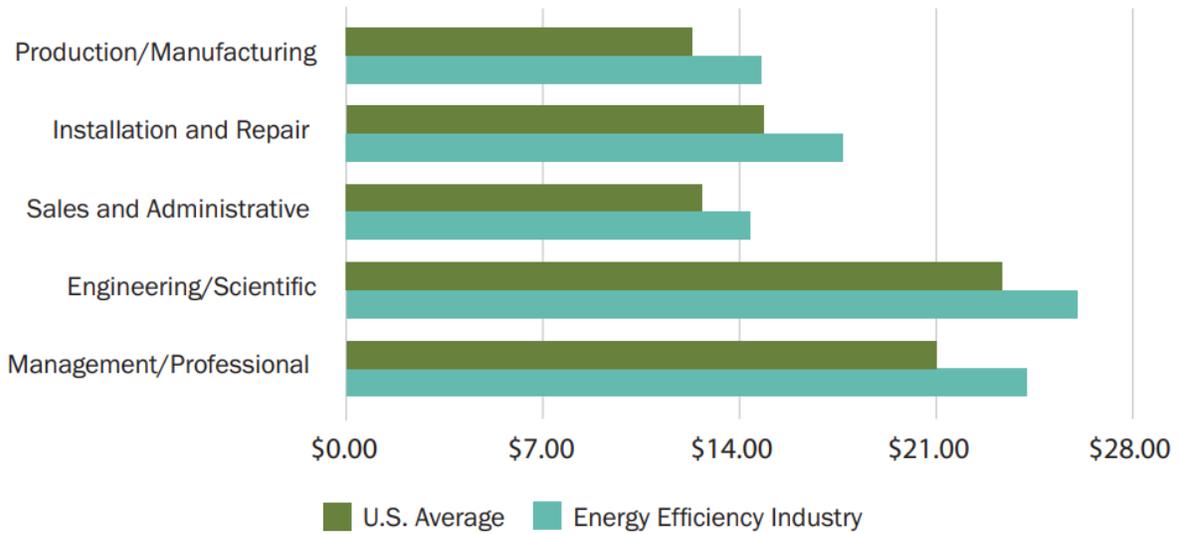


**Figure 2. Types of Energy Efficiency Jobs by Industry and Sector**

Source: E4TheFuture (2021)

Although the current energy efficiency jobs total is still 9% below the pre-pandemic peak in 2019, energy efficiency sector job growth continues to outpace U.S. employment overall. The total number of energy efficiency jobs is now equal to the number of jobs in electric power generation and transmission, distribution, and storage combined (DOE 2022).

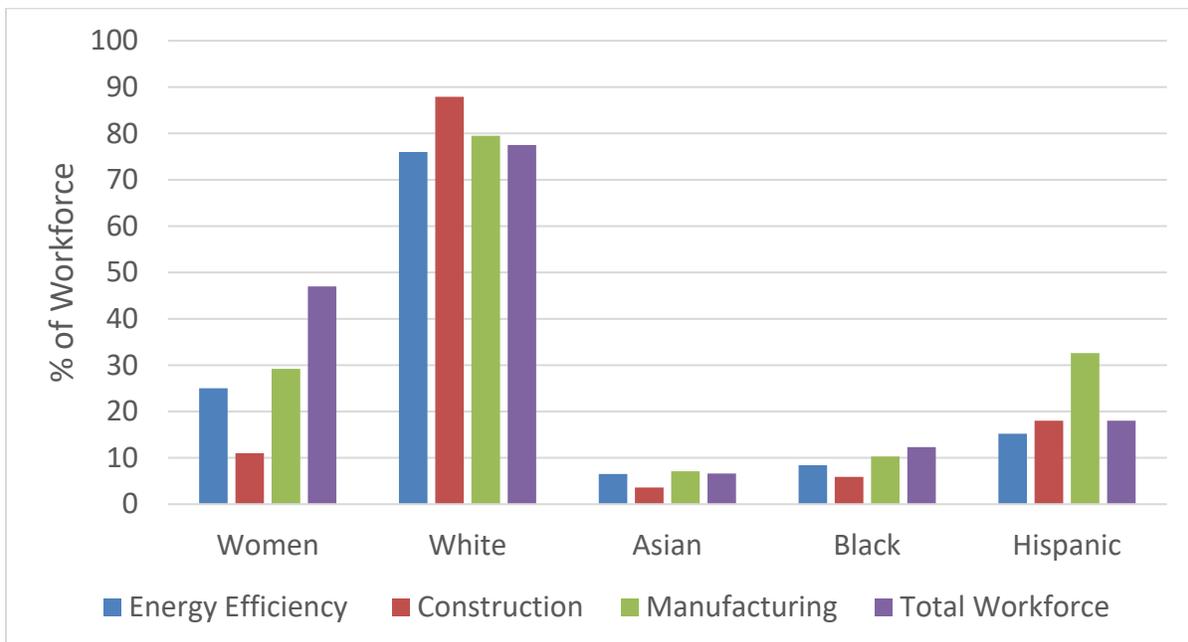
At a national level, energy efficiency jobs offer competitive wages and benefits compared to national averages. The median hourly wage for an energy efficiency worker in the United States is \$24.44, compared to \$19.14 for all workers, and more than three-quarters of energy efficiency employers contribute to health insurance and retirement accounts (E4TheFuture 2021). Entry-level energy efficiency jobs have pay rate advantages over traditional jobs in every industry subsector, as illustrated in Figure 3. At the same time, energy efficiency jobs tend to require less formal education than the national workforce overall, and less than related fields such as clean energy production. For example, more than 50% of the energy efficiency workforce has a high school diploma or less, and only 15% have bachelor degrees or higher (Muro et al. 2019). These benefits and relatively low barriers for entry into the workforce are important for this project, as most Corpsmembers entering the energy efficiency industry are likely to start in near-entry-level positions when they first complete their term of service.



**Figure 3. Entry-level wages by sector: energy efficiency jobs vs. national average**

Source: E4TheFuture (2021)

Despite the benefits described above, the energy efficiency industry lags behind the United States overall, as well as traditional industries like construction and manufacturing, in terms of gender, race, and ethnic diversity, illustrated in Figure 4. This makes the work of Corps programs that engage directly with underserved communities all the more important to the health and equity of this growing industry.



**Figure 4. Demographics of energy efficiency vs. other industry workforces**

NREL analysis based on data from U.S. Bureau of Labor Statistics (2021) and E4TheFuture (2021)

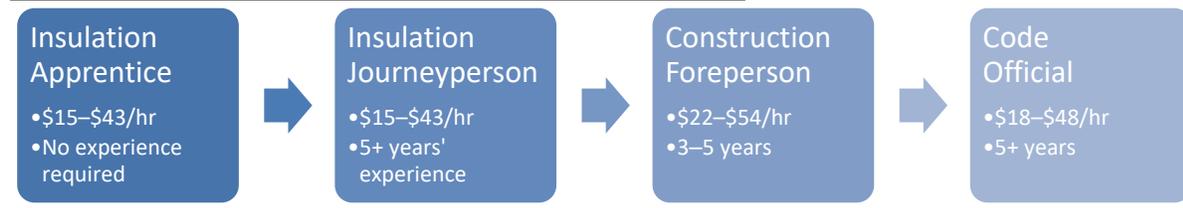
## 2.1 Career Pathway Opportunities

This section provides examples of the types of occupations that currently exist in energy efficiency. It is not intended as an exhaustive list, but highlights a variety of entry-level<sup>2</sup> jobs and career pathway opportunities that can follow. More detailed information can be found by navigating through three career map tools developed for DOE: the Green Buildings Career Map,<sup>3</sup> HVAC Career Map,<sup>4</sup> and Advanced Manufacturing Career Map.<sup>5</sup>

### 2.1.1 Sample Construction Pathways

According to E4TheFuture (2021), more than half of all energy efficiency workers (more than 1.1 million) work in the construction field. These jobs involve installation and repair of energy efficiency measures and appliances for residential, commercial, industrial, and institutional projects. This category also includes workers that inspect or utilize technology to assess and evaluate the energy efficiency of buildings. Some sample entry-level jobs are described below, with information on pathway opportunities. Jobs are categorized according to whether they involve either new construction or retrofit of existing buildings, and information includes occupation type, wage ranges, and the total number of years of experience required for each position. For consistency, all information is based on DOE Career Map tools and may not align perfectly with other industry-specific research. Where more specific data is available, this has been noted and linked in the footnotes.

#### New Construction – Commercial Insulation Professionals



#### Existing Building Retrofits – Home Energy Professionals<sup>6</sup>



<sup>2</sup> Entry-level is here defined as jobs that do not require a college degree or advanced certifications.

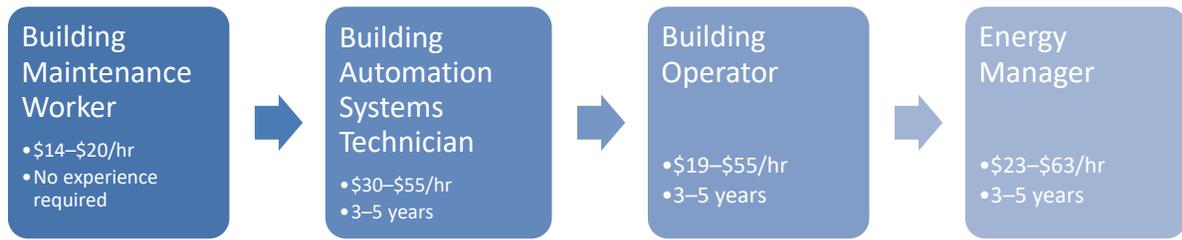
<sup>3</sup> <https://greenbuildingscareermap.org/>

<sup>4</sup> <https://hvaccareermap.org/>

<sup>5</sup> <https://advancedmanufacturing.careerpathplatform.com/map/>

<sup>6</sup> “Building Performance Installer” is the generic entry-level job title used in the Green Buildings Career Map. Within the HEP certification system, and later in this paper, this position is referred to as “Retrofit Installer/Technician.” Select state and county data on wages for HEP occupations within the WAP available at <https://nascsp.org/wage-surveys/>.

## Building Operations and Automation

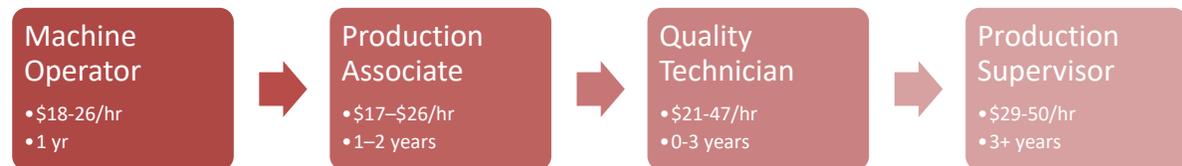


## Climate Control Technology/HVAC



### **2.1.2 Sample Manufacturing and Trade Pathways**

E4TheFuture (2021) found that 22% of all energy efficiency workers (465,417) work in manufacturing. These jobs include production and assembly work creating energy efficiency products such as efficient lighting and appliances, insulation, and heat pumps. Most of these jobs do not require a 4-year college degree. There are also opportunities in energy management for industrial facilities which often require specialized training and certification, but may not require a college degree. One sample manufacturing career pathway is offered below, and more can be explored via the Advanced Manufacturing Career Map.



### **2.1.3 Professional Services Pathways**

According to E4TheFuture (2021), 24% of all energy efficiency workers (507,728) work in a wide variety of professional services that include architecture, engineering, sales, finance, research and development, training and education, and program administration and management. Many of these jobs do not require installation experience (for example, a year of related Corps service); however, this experience can be incredibly beneficial. Although there are very few architecture or engineering entry-level jobs that exist, below is a sample career pathway for professional or administrative roles within buildings energy efficiency. More pathways can be explored via the Green Buildings Career Map.



## 2.2 Apprenticeship in Buildings Energy Efficiency

Apprenticeships are a model for career-specific training that incorporate industry-recognized education, hands-on skills training, and employment in a structured way. The apprenticeship model typically includes the trainee/employee (apprentice), employer (sponsor), and an education provider. Components of an apprenticeship also include industry-recognized credentials, mentorship, and clear progressive wage and responsibility growth over the term of apprenticeship. Apprenticeships typically last one to five years depending on the industry (U.S. Department of Labor 2022). Typically, the term “apprenticeship” refers to programs that are registered with the U.S. Department of Labor or individual state departments of labor, and known as Registered Apprenticeship programs (RAPs). However, many organizations use the general term “apprenticeship” to describe programs that follow the same general model, whether or not they are formally registered.

“Pre-apprenticeships” are intended to prepare workers/learners for a specific apprenticeship or career track. These programs are often shorter in duration and focus on not only career skills but also general employability skills and supportive services (U.S. Department of Labor 2022).

Some apprenticeship and pre-apprenticeship models are informal, created and managed independently by employers or training providers. In contrast, RAPs are registered with state and/or federal departments of labor and provide a more rigorous approach to ensure industry relevance, fair wages, and safe working environments for apprentices.

The home energy industry has not uniformly embraced the apprenticeship model. However, below are some union-based apprenticeship programs in related areas that are available nationwide. Some of these are also included in the case studies provided in Appendix A.

- Home Builders Institute (HBI) Pre-Apprenticeship Programs**  
<https://hbi.org/pre-apprenticeship/>  
 HBI’s pre-apprenticeship programs are offered nationwide through a partnership with Job Corps and include construction, electrical, HVAC, and solar training that feed into formal building trade apprenticeship programs.
- North America’s Building Trades Union (NABTU) Apprenticeship Readiness Program**  
<https://nabtu.org/apprenticeship-and-training/apprenticeship-readiness-programs/>  
 NABTU offers a 120-hour apprenticeship readiness program designed to feed into formal building trades apprenticeship programs across the country.

- **International Association of Heat and Frost Insulators and Allied Workers (Insulators Union) Apprenticeship Program**  
<https://www.insulators.org/become-an-apprentice>  
 The Insulator’s Union Joint Apprenticeship and Training Committee program includes employment readiness, general safety, asbestos and lead-safe practices, and energy audit training in addition to installation-specific training and education.
- **Union Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry (Union Association) Heating, Ventilation, Air Conditioning and Refrigeration (HVACR) Service Technician Training Programs**  
<https://ua.org/hvacr-service-technicians/>  
 The Union Association’s training programs prepare HVACR technicians to work in the residential, commercial, and industrial sectors.
- **Sheet Metal, Air, Rail and Transportation (SMART) Union Training Programs**  
<https://smart-union.org/our-priorities/training/>  
 SMART apprentices work in a variety of fields, including HVACR installation and fabrication, but also manufacturing, drafting, and bus and rail operations and mechanics.

In addition to the programs listed above, the Building Performance Association (BPA) is developing resources to support home energy employers in offering a RAP for the Energy Auditor position (Walter 2022). This would be the first home energy RAP available at a national level, though individual weatherization agencies have pursued similar efforts at a local level, as noted in Appendix A.

### 3 Home Energy Professional Knowledge, Skills, and Certifications

The previous section provided an overview of a broad array of occupation types available within the buildings energy efficiency industry, along with illustrations showing skills transferability along several career pathways. This section dives into specific knowledge, skills, and certifications that are preferred and/or required for different jobs along one specific career pathway: HEPs—people involved in retrofitting existing homes to make them healthier, safer, and more energy efficient. As mentioned in the methodology section, this particular pathway was chosen for the remainder of this report for several reasons. First, there is a clear and industry-recognized pathway. Second, it is aligned with the types of programs and training that most TCN Corps are involved in. Third, HEP installers and technicians gain a variety of skillsets that are highly transferable to the other related industries described in the previous section.

The HEP career pathway includes four main occupations or positions that are recognized within the home performance industry. Descriptions are provided below, taken from the Green Buildings Career Map (IREC 2022).

1. **Building Performance Installer or Technician:** “Building Performance Installers perform upgrades to residential homes to reduce heat loss and air leakage and to increase the efficiency and safety of mechanical systems.”

2. **Building Performance Crew Leader:** “Building Performance Crew Leaders supervise the installation of energy efficiency upgrades, closely monitoring crew performance, work quality, safety, and customer needs.”
3. **Energy Auditor:** “Residential Energy Auditors conduct onsite energy audits and assessments and perform energy modeling to determine the current and desired energy performance, safety, and durability of single-family buildings.”
4. **Quality Control Inspector:** “Quality Control Inspectors verify the compliance of energy retrofit work based on applicable installation standards and codes using visual and diagnostic data and specify corrective actions where necessary to achieve the intended performance of installed measures.”

In the previous section, this career pathway was shown as linear. In reality, there are multiple possible routes that workers can follow. For example, with just three years of experience, an installer or technician could move either to a Crew Leader position or an Energy Auditor. Either pathway could then lead to the position of Quality Control Inspector.

Table 1 summarizes specific education, experience, certifications, and skills for each occupation within the HEP career track.<sup>7</sup> This table is intended to summarize information from the more interactive Green Buildings Career Map into one location and help Corps programs understand the career requirements and expectations for this particular pathway opportunity. It is not expected that Corps programs will address all these skills, but they can start to identify where and what they have capacity to address to prepare their Corpsmembers for potential employment in the industry upon program completion.

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<sup>7</sup> In addition to the occupation-specific skills listed below, all positions also build upon and include the preferred skills and requirements listed for Building Performance Installer.

**Table 1. Home Energy Professional Qualifications (IREC 2022)**

<b>Occupation</b>	<b>Preferred Education</b>	<b>Preferred Experience</b>	<b>Preferred/ Recognized Certifications <sup>a</sup></b>	<b>Preferred Skills &amp; Requirements</b>
Building Performance Installer <sup>b</sup>	High school diploma or equivalent	Experience with hand tools	<ul style="list-style-type: none"> <li>• BPI Building Science Principles (BSP) Certificate</li> <li>• Air Leakage Control Certification</li> <li>• Infiltration and Duct Leakage Certification</li> </ul>	<p>Soft Skills</p> <ul style="list-style-type: none"> <li>• Positive attitude and desire to learn</li> <li>• Ability to follow directions</li> <li>• Excellent customer service skills</li> <li>• Good verbal and written communication skills</li> <li>• Ability to work independently and as part of a team</li> </ul> <p>Technical Skills</p> <ul style="list-style-type: none"> <li>• Ability to work safely with hand and power tools</li> <li>• Ability to work at heights and on ladders</li> <li>• Ability to safely lift up to 50 lbs.</li> <li>• Ability to work in confined spaces, attics, and basements</li> <li>• Ability to maintain a safe and clean working environment</li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>• Basic math skills</li> <li>• Proficient with computers and phones</li> <li>• Valid driver's license and insurable driving record</li> </ul>
Building Performance Crew Leader <sup>c</sup>	<ul style="list-style-type: none"> <li>• High school diploma or equivalent</li> <li>• 2-year vocational/technical school training (construction, HVAC, or other trades)</li> </ul>	3–5 years in construction, HVAC, or building performance installation	<ul style="list-style-type: none"> <li>• BSP Certificate</li> <li>• Site Supervisor Certificate</li> <li>• Crew Leader Certification</li> </ul>	<p>Technical Skills</p> <ul style="list-style-type: none"> <li>• Strong understanding of the residential construction and maintenance industry</li> <li>• Knowledge of green building design, green construction, and energy efficiency techniques and technology</li> <li>• Strong knowledge of residential weatherizing, insulation, and air sealing techniques and technology</li> <li>• Ability to read, interpret, utilize, and train on diagrams, drawings, and equipment manuals</li> </ul> <p>Soft Skills</p> <ul style="list-style-type: none"> <li>• Demonstrated ability and willingness to take on responsibility and leadership roles</li> </ul>

Occupation	Preferred Education	Preferred Experience	Preferred/ Recognized Certifications <sup>a</sup>	Preferred Skills & Requirements
Residential Energy Auditor <sup>d</sup>	<ul style="list-style-type: none"> <li>• High school diploma or equivalent</li> <li>• 2-year vocational/technical school training (construction, HVAC, or other trades)</li> </ul>	1–3 years in building performance installation	<ul style="list-style-type: none"> <li>• Building Analyst Certification</li> <li>• Energy Auditor Certification</li> <li>• RESNET HERS Rater Certification</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to motivate, manage, and train a team of building performance installers and technicians at various skill levels</li> <li>• Ability to multi-task and juggle multiple priorities</li> <li>• Demonstrated attention to detail</li> <li>• Strong organizational skills</li> <li>• Strong critical thinking and problem-solving skills</li> <li>• Ability to maintain a professional appearance</li> </ul> <p>Technical Skills</p> <ul style="list-style-type: none"> <li>• Knowledge of the tools and techniques used in residential energy audits</li> <li>• Knowledge of sustainability, energy efficiency, and green building principles, particularly related to HVAC systems</li> <li>• Strong understanding of the residential construction and maintenance industry</li> <li>• Experience with energy modeling tools and software</li> </ul> <p>Soft Skills</p> <ul style="list-style-type: none"> <li>• Demonstrated attention to detail</li> <li>• Strong organizational skills</li> <li>• Strong critical thinking and problem-solving skills</li> <li>• Ability to maintain a professional appearance</li> </ul>
Quality Control Inspector <sup>e</sup>	<ul style="list-style-type: none"> <li>• High School Diploma or Equivalent</li> <li>• 2-year vocational/technical school training (construction,</li> </ul>	1–3 years in construction, HVAC, or building performance installation	<ul style="list-style-type: none"> <li>• Quality Control Inspector Certification (BPI or RESNET)</li> </ul>	<p>Technical Skills</p> <ul style="list-style-type: none"> <li>• Strong understanding of the residential construction and maintenance industry</li> <li>• Knowledge of green building design, green construction, and energy efficiency techniques and technology</li> <li>• Knowledge and understanding of HVAC equipment and technology</li> <li>• Strong knowledge of state and local building codes</li> <li>• Proficient in reading field drawings</li> </ul>

Occupation	Preferred Education	Preferred Experience	Preferred/ Recognized Certifications <sup>a</sup>	Preferred Skills & Requirements
	HVAC, or other trades)			<ul style="list-style-type: none"> <li>• Ability to interpret diagrams, drawings, and equipment manuals</li> </ul> Soft Skills <ul style="list-style-type: none"> <li>• Ability to multi-task and juggle multiple priorities</li> <li>• Demonstrated attention to detail</li> <li>• Strong organizational skills</li> <li>• Strong critical thinking and problem-solving skills</li> <li>• Ability to maintain a professional appearance</li> </ul>

<sup>a</sup> This column lists both *certificates* that an individual can earn, and *certifications* for certified professionals with specific knowledge and expertise. Both certificates and certifications require an exam to be passed. Unless otherwise noted, all certifications listed here are offered through the Building Performance Institute (BPI)

<sup>b</sup> <https://greenbuildingscareemap.org/jobs/building-performance-installer>

<sup>c</sup> <https://greenbuildingscareemap.org/jobs/building-performance-crew-leader>

<sup>d</sup> <https://greenbuildingscareemap.org/jobs/residential-energy-auditor>

<sup>e</sup> <https://greenbuildingscareemap.org/jobs/qc-inspector>

## 4 Home Energy Professional Education and Training Resources

The example career pathway provided in this report for workers in the home energy industry is intended to help TCN organizations educate and prepare their Corpsmembers for employment at the end of their term of service. However, because the three occupations and related certifications beyond Building Performance Installer require more than one year of experience, they are not likely to be achievable for Corpsmembers in one term of service. This section focuses on education and training resources that can prepare Corpsmembers to either take the BSP Certificate exam or acquire hands-on learning for tasks and skills needed as an Installer.

Because these certificates and professional occupations are widely adopted by the home performance industry, including by the federal WAP, there is a wide variety of related education and training resources available. These include online and in-person trainings provided by private industry-credentialed training providers. While most training services are available for a fee, there is also a variety of free resources available to guide both education and skills training related to the home energy career path, some of which can be downloaded and customized by users. These resources are listed and described below.

### 4.1 In-Person and Online Training HEP Resources

To pursue certification pathways for HEPs, one approach is to coordinate with an accredited training provider to provide in-person education and training. These services will have a cost associated with them. Most providers require learners to travel to their location, but some may travel to provide training at a host location.

Weatherization Training Centers (National Association for State Community Services Programs [NASCS])

<https://nascsp.org/wap/waptac/weatherization-training-centers/>

There are 22 Training Centers located across the country that have been designated by DOE for use by WAP agencies to train their staff to become Crew Leaders, Energy Auditors, or Quality Control Inspectors. Beyond this certification-specific training, most Training Centers offer a variety of related buildings energy efficiency classroom education and hands-on training to individuals and organizations outside of WAP, including BSP certification.

A list of WAP Training Centers is maintained on the NASCS website linked above. Search the map for the nearest location to find their website and offerings.

All Credentialed Home Energy Performance Training Providers (IREC)

<https://irecusa.org/clean-energy-training/credentials/credential-holder-registry/>

IREC verifies and accredits instructors and trainers in the home energy performance space. The IREC website maintains an up-to-date list of all accredited training providers for HEP and other certifications. Visitors can search by the credential for which the provider offers training and by location (state). This list includes the Weatherization Training Centers described above.

Although the certifications they offer may be more in depth or require more time and training

than what most TCN organizations may be able to accomplish in a one-year term of service, they offer individual courses that may be relevant.

## 4.2 Free and Adaptable HEP Education and Training Resources

This section outlines open-source resources developed for the WAP to support training for field staff. These tools can be used in several ways by TCN organizations to guide or supplement education and skills training related to buildings energy efficiency.

### HEP Job Task Analysis (JTA)

<https://www.energy.gov/eere/wipo/guidelines-home-energy-professionals-accredited-training>

The JTAs outline core knowledge areas, critical work functions, and skills for each of the HEP occupations ([Crew Leader](#), [Energy Auditor](#), and [Quality Control Inspector](#)). These were created by NREL and are updated regularly by a committee of industry representatives. The JTAs can be used by TCN organizations to identify the competencies they may want to address in their training programs and understand how these relate to certified professional occupations.

### Standard Work Specifications (SWS)

<https://sws.nrel.gov/>

The SWS provide a foundation for standardizing the safety and quality of all HEP work performed throughout the country. The SWS describes each task addressed in residential retrofits and includes both the desired outcome of the task and what type of building it can apply to. The SWS could be used by TCN organizations to ensure that any work they are training their Corpsmembers to complete in homes is meeting industry standards.

### Retrofit Installer Job Aids

<https://www.energy.gov/eere/wap/weatherization-job-aids-retrofit-installer-technicians>

Because there is no formal certification or JTA for Retrofit Installers, the Job Aids were developed to provide another level of detail under the SWS. For each specific task identified in the SWS for Installers, a Job Aid describes and illustrates with photos what successful completion of that task can look like. The Job Aids are intended to be used by workers, trainers, or supervisory staff to help newly hired workers understand what the end products of their work should look like and accomplish.

The Job Aids could be used by TCN organizations to ensure that any work they are training their Corpsmembers to complete in homes is meeting industry standards.

### Retrofit Installer Badges Toolkit

<https://sws.nrel.gov/installerbadges>

The Retrofit Installer Badges Toolkit (Toolkit) is a “micro-credentialling” project developed by NREL to facilitate employers and training organizations in tracking and assessing the skills of entry-level Installers in a consistent way across the country. The Toolkit offers 25 badges that represent different energy efficiency tasks that an Installer could work on. The Toolkit is aligned with the SWS and Job Aids, outlining not only how each task should be done, but also offering

materials including a spreadsheet and “passport” to help trainers or employers track workers’ skills development progress.

The Toolkit could be used by TCN organizations to track the hands-on skills that their Corpsmembers gain throughout the year. Because it is tied to industry-recognized SWS, a TCN organization could also use this in early-stage conversations with employers and employer partners to identify which tasks and skills are valuable to them, which would then help customize training and education to support those specific tasks.

### 3DHouse

<https://www.energy.gov/eere/wap/weatherization-installer-job-aids-and-single-family-interactive-3d-house>

The 3DHouse is an interactive virtual tool developed by NREL and DOE to provide another way to introduce students, trainees, or new workers to the types of tasks common for HEP Installers. The 3DHouse offers a virtual tour of a standard single-family home, identifying retrofit projects throughout and linking to the appropriate Job Aid and SWS.

The 3DHouse tool could be used by TCN organizations as an introduction for new Corpsmembers to the types of energy retrofit tasks that they might work on during their term, or the types of work they might perform in a future career as an HEP.

### Weatherization Standardized Curricula

<https://www.energy.gov/eere/wap/weatherization-management-resources/weatherization-training-resources/weatherization-0>

The Weatherization Standardized Curriculum (Curriculum) was developed by DOE more than a decade ago, as the WAP was first working to standardize installation practices, training, and certifications. It was the original foundation for many training modules developed by accredited training agencies. Within the different sections, the Curriculum offers lesson plans and PowerPoint presentations that can be downloaded and used by anyone.

It is important to note that these resources have not been updated since their release, even though the SWS, JTAs, and other related tools have undergone regular industry-vetted updates. The building science content of this Curriculum remains relevant; however, photos, specific technologies, and specific WAP data may be out of date. In addition, use of these resources also does not imply that a learner has received accredited training. Understanding the limitations of this tool, TCN organizations could use any of these training resources to help them develop their own in-house training on buildings energy efficiency.

## **4.3 Other Education and Training Resources**

This section identifies other educational resources (free and fee for service) that are not HEP- or WAP-specific, but were developed by federal and industry-recognized groups.

### Solar Decathlon

<https://www.solardecathlon.gov/building-science.html>

The Solar Decathlon is a DOE-funded collegiate competition program with the goal of preparing “the next generation of building professionals to design and build high-performance, low-carbon buildings powered by renewables.” The Solar Decathlon website includes a 10-module Building Science Education series. These videos cover a variety of topics for Solar Decathlon participants, many of which can be relevant for any audience interested in building performance.

DOE Building Science Education Solution Center

<https://bsesc.energy.gov/training-modules/>

The Building Science Education Solution Center offers peer-reviewed training modules on different building science topics, both the science fundamentals and building component and technology specifics, from lighting to windows and heat pumps. The modules are intended for use by a wide array of audiences, and include resources for instructors including learning objectives, lecture notes, teaching materials, and problem sets.

DOE Building America Solution Center

<https://basc.pnnl.gov/>

The Building America Solution Center offers a wide variety of materials on high-performance construction topics. The website includes a library of guides on specific building topics including air sealing, insulation, heat pumps, and windows.

High Performance Insulation Professionals (HPIP) Online Training Hub

<https://www.insulationtraining.org/online-training>

HPIP maintains an extensive online learning management system with training and credentialing opportunities related to building science, air sealing and construction, safety, as well as soft skills, job readiness, and business and sales fundamentals.

## 5 Conclusion and Next Steps

The Corps program model is well positioned to prepare Corpsmembers for employment in the buildings energy efficiency industry, as it aligns with individual program and organization goals and capabilities. This is because the energy efficiency industry offers a range of entry-level positions that Corps programs can prepare their members for during a typical term of service. In particular, training for HEP-specific occupations offer highly transferable—and therefore employable—skills not only in energy efficiency but climate, energy, and community service career tracks more generally.

There is a wealth of resources available to help prepare workers to enter and move up HEP career ladders. This report was designed to support Corps programs in providing energy efficiency-related training and education that is aligned with industry standards and expectations. We encourage Corps programs with existing energy efficiency or related programs to not only explore these education and training resources, but to identify and work with partner organizations such as the WAP or others to ensure they are training to industry standards and local employer needs, and to offer direct connections to employment opportunities.

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## Appendix A. Case Studies in Buildings Energy Efficiency Training Programs

The following case studies provide examples of energy efficiency training programs that can provide models for Corps programs interested in designing their own. The first four are location-specific programs managed by nonprofits. The final two are associated with union apprenticeship programs and are broader in scope and available throughout the country.

Building Green Futures Program at Pennsylvania College of Technology, PA  
<https://centralpacareerlink.org/individual-services/building-green-futures/>

The Clean Energy Center at the Pennsylvania College of Technology is a Weatherization Training Center which has just launched its Building Green Futures program. This three-week in-person training program includes both technical and soft skills to prepare and connect trainees to jobs in home energy performance. The program includes Occupational Safety and Health Administration (OSHA) 10 and BPI Building Science Principles certifications, hands-on skills training, job shadowing, and networking opportunities with local weatherization agencies. It is looking to expand its engagement with organizations that provide broader wrap-around services to support more diverse trainees.

Home Energy Career Training at Center for Energy and Environment, MN  
<https://www.mncee.org/job-training>

The Center for Energy and Environment in Minnesota utilized a grant from Xcel Energy to develop a Home Energy Career Training program geared towards individuals from historically under-represented groups in the energy efficiency sector. The program combines paid five-week in-person training shaped around the BPI Building Science Principles certification with paid internship opportunities with either energy auditor or insulation contractors, both of which result in BPI certifications. The Center for Energy and Environment partners with local utilities and WAP agencies for employment opportunities.

Earth Advantage, OR  
<https://www.earthadvantage.org/initiatives/workforce-training.html>

Earth Advantage, located in Portland, Oregon, partners with community-based organizations to provide green building training and professional accreditation. Trainings are built upon a two-day green building/building science curriculum, with additional opportunities available through its partners, including programs for youth of color. Earth Advantage had started using the Installer Badges Toolkit as a way to track skills and progress of their trainees.

United Way Long Island E3 Green Building Center, NY  
<https://www.unitedwayli.org/e3-smartbuild-training-center>

United Way of Long Island partners with the New York State Energy Research and Development Authority to offer the E3 SmartBuild Training Center. This offers training and career exploration in weatherization, green building, and sustainability. Programs include a YouthBuild and VetsBuild program.

Weatherization Apprenticeship Program, MO

<https://communityactionpartnership.com/webinar/a-practical-approach-to-weatherization-workforce-challenges/>

In 2021, the North East Community Action Corporation, which administers the WAP in the region, developed a registered apprenticeship and pre-apprenticeship program. The RAP is a one-year program which includes 144 hours of classroom education through a WAP Training Center, plus 2,000 hours of on-the-job training. NECAC works with local technical schools and high schools to recruit participants and has been able to hire graduates to their staff full time.

North America's Building Trades Union Multi-Craft Core Curriculum, Nationwide

<https://nabtu.org/apprenticeship-and-training/apprenticeship-readiness-programs/>

North America's Building Trades Union offers a 120-hour apprenticeship-readiness program designed to feed into formal building trades apprenticeship programs. The Muti-Craft Core Curriculum includes an elective option in Green Construction.

Home Builders Institute Pre-Apprenticeship Program, Nationwide

<https://hbi.org/pre-apprenticeship/>

The Home Builders Institute has developed pre-apprenticeship programs that feed into formal building trade apprenticeship programs. The pre-apprenticeship programs are offered through a partnership with Job Corps, and include construction, electrical, HVAC, and solar programs.

## Appendix B. PowerCorps Energy Efficiency Job Market Research

In Philadelphia, Buffalo, and Boston, PowerCorps engages young adults (18–30 years old), primarily young adults of color, some with court involvement, who do not have living-wage, quality jobs to accelerate their pathway to career-track positions in green infrastructure and clean energy as a way to support individual success and community advancement simultaneously. These offices have existing [career academies](#) and want to create an Energy Academy focused on buildings energy efficiency.

Through their membership with TCN, PowerCorps requested technical assistance from NREL to conduct an employment landscape assessment of each of the three regions. The PowerPoint presentation outlining job market data for each region is provided on the following pages.



# Regional Market Analysis for Three PowerCorps Program Locations

Allison Moe  
National Renewable Energy Laboratory (NREL)  
July 2022

# Project Background

In Philadelphia, Buffalo, and Boston, PowerCorps engages young adults and accelerates their pathway to career-track positions in green infrastructure and clean energy as a way to support individual success and community advancement simultaneously.



Source: <https://powercorpsphl.org/>

# Project Background

Through their affiliation with The Corps Network and the Better Buildings Workforce Accelerator, PowerCorps requested technical assistance from NREL to conduct a market employment landscape assessment of each of the three regions. This information is intended to support their development of Energy Academies focused on buildings energy efficiency.



Source: <https://powercorpsphl.org/>

# Contents

**1** National Overview

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**2** Philadelphia

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**3** Buffalo

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**4** Boston

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# National Overview

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# Jobs & Demand

## Energy efficiency employed more than 2 million Americans in 2021\*

- Energy efficiency jobs can be found in 99.8% of counties
- Despite COVID-related decreases in 2020, energy efficiency jobs grew by 3.3% in 2021, and employers predict an increase in hiring for 2022, bringing employment close to the 2019 peak

## Energy efficiency employers report difficulty in hiring:

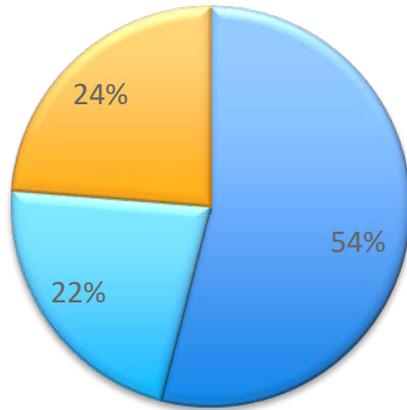
- 91% of construction employers
- 80% of professional/business employers

\* Includes workers spending 50% or more of their time doing energy efficiency work

Data source: [https://www.energy.gov/sites/default/files/2022-06/USEER%202022%20National%20Report\\_1.pdf](https://www.energy.gov/sites/default/files/2022-06/USEER%202022%20National%20Report_1.pdf)

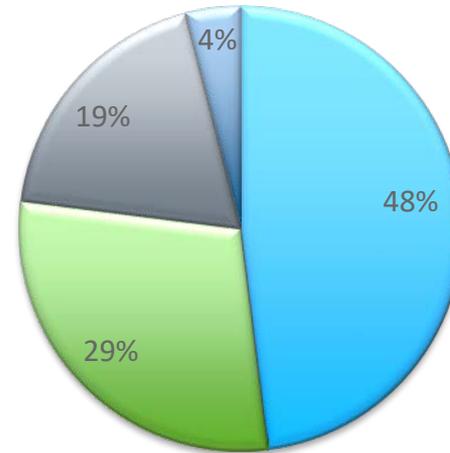
# Jobs & Demand

## Energy Efficiency Employment by Industry



- Construction
- Manufacturing\* and Trade
- Professional and Other Services

## Energy Efficiency Employment by Sector

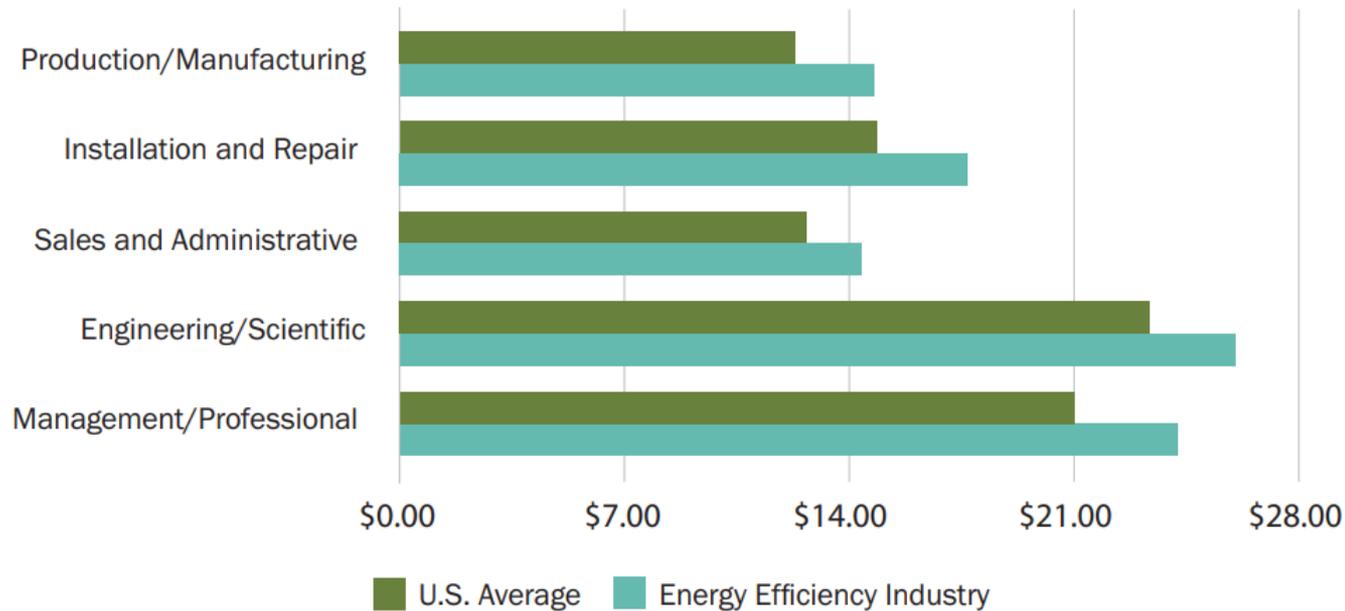


- Heating, Ventilating, and Air Conditioning (HVAC)
- ENERGY STAR (Appliances & Efficient Lighting)
- Building Materials and Insulation
- Other (energy audits, building certifications, software, etc.)

\* Manufacturing employment only includes jobs involved in the production of EE goods, not jobs involved in making manufacturing facilities or processes more energy efficient.

# Wages & Benefits

Wages for energy efficiency jobs are higher than for the US jobs overall



# Wages & Benefits

The median hourly wage for energy efficiency workers was \$24.44  
28% higher than national median

Energy Efficiency Occupations, 2019 Median Hourly Wages

	2019 National Median Hourly Wages <sup>75</sup>	Energy Efficiency Wage Premium or Discount Compared to National Median <sup>76</sup>	Energy Efficiency Wage Premium Compared to Weighted Construction Median <sup>77</sup>
<b>Construction Managers</b>	\$ 45.97	140%	98%
<b>First-Line Supervisors of Construction Trades and Extraction Workers</b>	\$ 31.47	64%	35%
<b>Electricians</b>	\$ 29.76	55%	28%
<b>Plumbers, Pipefitters, and Steamfitters</b>	\$ 29.22	53%	26%
<b>Heating, Air Conditioning, and Refrigeration Mechanics and Installers</b>	\$ 28.32	48%	22%
<b>Carpenters</b>	\$ 25.60	34%	10%
<b>Insulation Workers, Floor, Ceiling, and Wall</b>	\$ 21.38	12%	-8%
<b>Construction Laborers</b>	\$ 19.52	2%	-16%

Wages and benefits access vary by industry and occupation

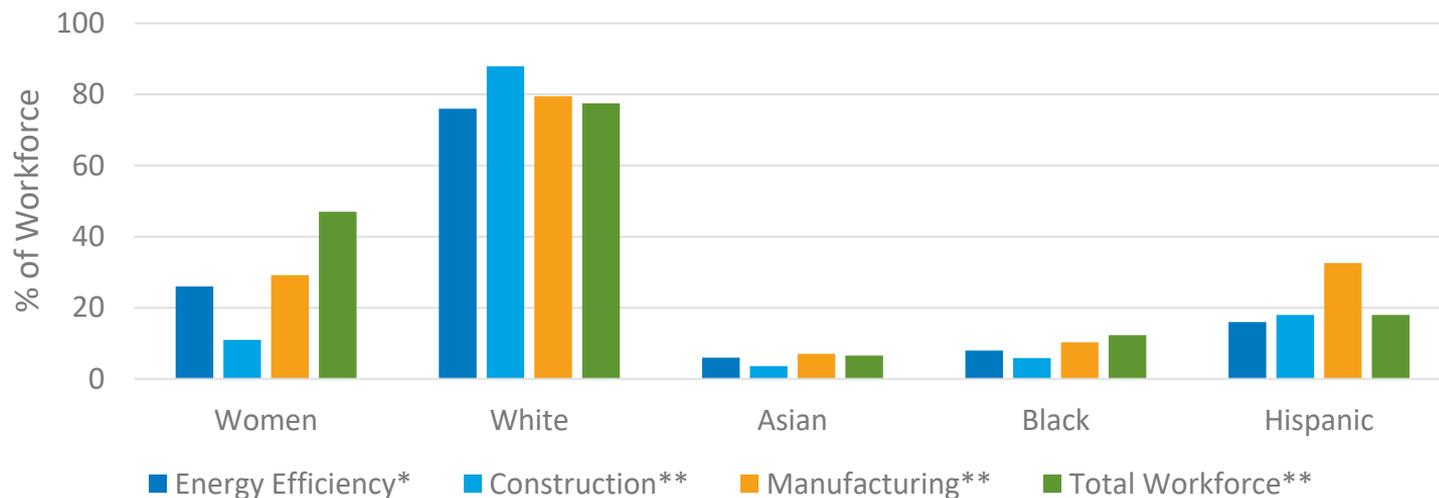
Healthcare and Retirement Benefits by Occupation, 2019

	Healthcare Benefits			Retirement	
	Full coverage	Partial coverage	No coverage	Firm contribution	No firm contribution
<b>Construction Managers</b>	36.6%	49.9%	13.6%	79.9%	20.1%
<b>First-Line Supervisors of Construction Trades and Extraction Workers</b>	37.0%	48.3%	14.7%	76.3%	23.7%
<b>Electricians</b>	29.3%	44.9%	25.8%	62.3%	37.7%
<b>Plumbers, Pipefitters, and Steamfitters</b>	31.9%	45.8%	22.3%	67.3%	32.7%
<b>Heating, Air Conditioning, and Refrigeration Mechanics and Installers</b>	26.5%	47.8%	25.6%	60.1%	39.9%
<b>Carpenters</b>	18.8%	46.6%	34.6%	54.6%	45.4%
<b>Insulation Workers, Floor, Ceiling, and Wall</b>	23.6%	56.0%	20.4%	68.9%	31.1%
<b>Construction Laborers</b>	26.1%	52.5%	21.4%	66.4%	33.6%

# Demographics

## Energy efficiency lags behind the national workforce in diversity

Demographics of Energy Efficiency  
vs. Other Industry Workforce



\* 2021 data source: [https://e4thefuture.org/wp-content/uploads/2021/10/Energy-Efficiency-Jobs\\_2021\\_All-States.pdf](https://e4thefuture.org/wp-content/uploads/2021/10/Energy-Efficiency-Jobs_2021_All-States.pdf)

\*\* 2022 data source: <https://www.bls.gov/cps/cpsaat18.htm>

# Weatherization Assistance Program Jobs, Demand, and Wages

## Weatherization Assistance Program (WAP) – Home Energy Performance Wages (2021)

Occupation	Hourly Wage Range
Retrofit Installer	\$13.50–\$19.50
Crew Lead	\$14.00–\$26.50
Energy Auditor	\$16.50–\$28.50
Quality Control Inspector	\$18.00–\$31.00
WAP Manager	\$22.00–\$38.50
Intake Specialist	\$12.50–\$23.00

# Regional Market Profiles

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Philadelphia

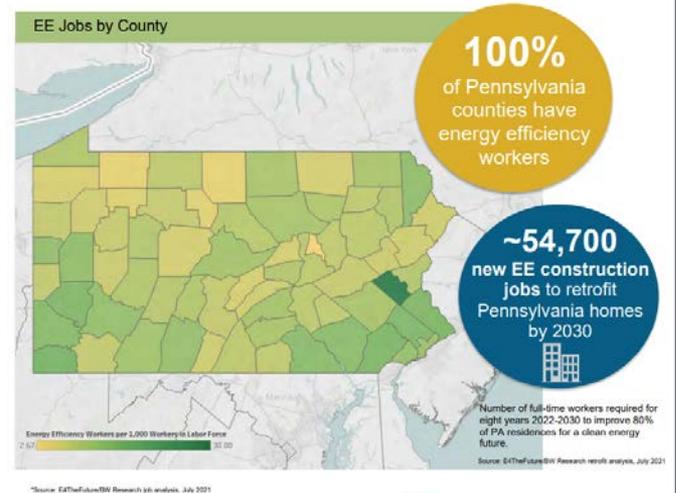
# Jobs Data

## State Data

- Energy efficiency workers in PA: 65,397
  - State had 5<sup>th</sup> highest energy efficiency job growth 2016–2019
  - Energy efficiency employment still 8% below 2019 peak
- Energy efficiency businesses in PA: 10,290
  - 85% have fewer than 20 employees

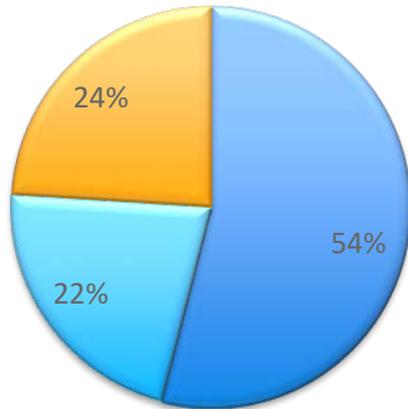
## Local Data

- Energy efficiency workers in Metro Area: 21,303 (Philadelphia-Camden-Wilmington)
- Energy efficiency workers in Philadelphia County: 6,875
- # of energy efficiency workers also available for congressional and state senate districts (see link below)



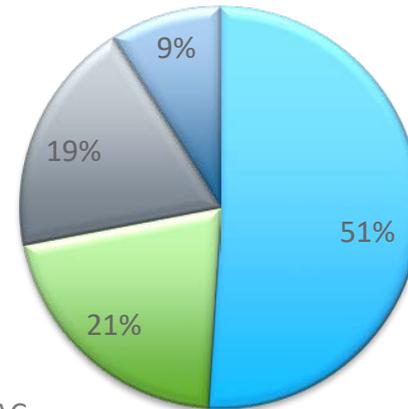
# Employment Breakdown

## PA Energy Efficiency Employment by Industry



- Construction
- Manufacturing and Trade
- Professional and Other Services

## PA Energy Efficiency Employment by Sector



- HVAC
- ENERGY STAR (Appliances & Efficient Lighting)
- Building Materials and Insulation
- Other (includes energy auditors)

# Weatherization Assistance Program

## WAP – Home Energy Performance Wages (2021)

Occupation	PA Avg. Hourly Wage
Retrofit Installer	\$15.50
Crew Lead	\$17.50
Energy Auditor	\$18.50
Quality Control Inspector	\$23.00
WAP Manager	\$26.50
Intake Specialist	\$15.50

# Weatherization Assistance Program

- Local WAP Agencies in PA: [69](#)
- Philadelphia area WAP is provided by:
  - Philadelphia Housing Development Corporation + [Energy Coordinating Agency](#)
- WAP + Interstate Renewable Energy Council (IREC) Accredited Training Center(s) serving PA:
  - [Energy Coordinating Agency](#) (Philadelphia)
  - [Pennsylvania College of Technology Clean Energy Center](#) (Williamsport)

# Regional Market Profiles

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Buffalo

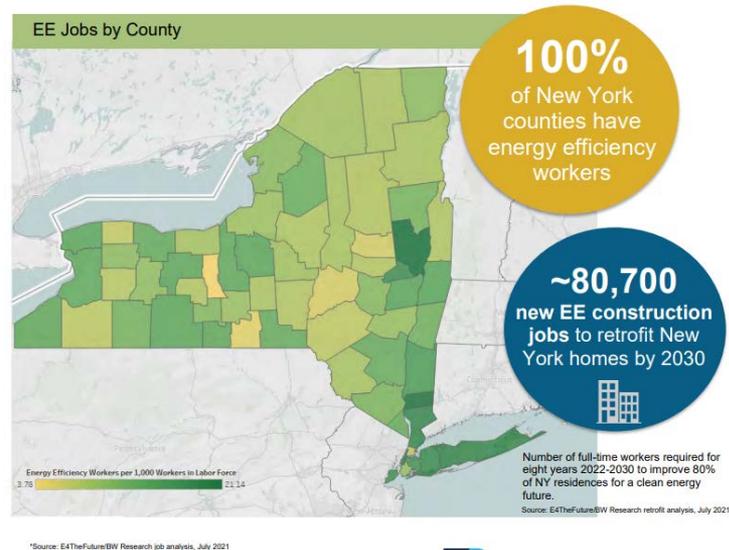
# Jobs Data

## State Data

- Energy efficiency workers in NY: 120,961
  - State had 3<sup>rd</sup> highest energy efficiency job growth 2016–2019
  - Energy efficiency employment still 3% below 2019 peak
- Energy efficiency businesses in NY: 20,816
  - 73% have fewer than 20 employees

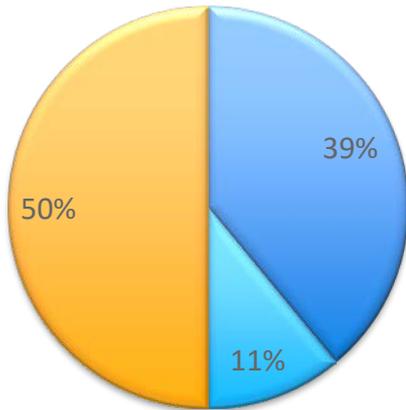
## Local Data

- Energy efficiency workers in Metro Area: 6,755 (Buffalo-Niagara Falls)
- Energy efficiency workers in Erie County: 5,284
- # of workers also available for congressional and state assembly districts (see link below)



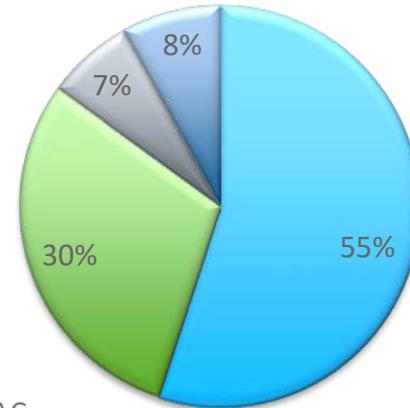
# Employment Breakdown

## NY Energy Efficiency Employment by Industry



- Construction
- Manufacturing and Trade
- Professional and Other Services

## NY Energy Efficiency Employment by Sector



- HVAC
- ENERGY STAR (Appliances & Efficient Lighting)
- Building Materials and Insulation
- Other (includes energy auditors)

# Weatherization Assistance Program

## WAP – Home Energy Performance Wages (2021)

Occupation	NY Avg. Hourly Wage
Retrofit Installer	N/A
Crew Lead	N/A
Energy Auditor	N/A
Quality Control Inspector	N/A
WAP Manager	N/A
Intake Specialist	N/A

# Weatherization Assistance Program

- Local WAP Agencies in NY state: [50](#)
- Buffalo area WAP is provided by:
  - [Neighborhood Housing Services of South Buffalo, Inc](#)
- WAP + IREC Accredited Training Center(s) serving NY State:
  - [New York State Weatherization Directors Association](#)  
(Syracuse, Erie, and Troy locations)
  - [Association for Energy Affordability, Inc.](#) (the Bronx)

# Regional Market Profiles

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Boston

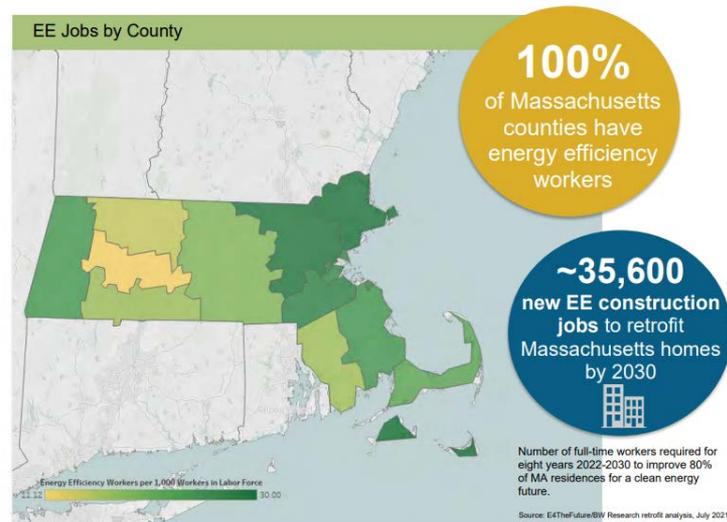
# Jobs Data

## State Data

- Energy efficiency workers in MA: 76,900
  - There are energy efficiency workers in every county
  - State had 6<sup>th</sup> highest energy efficiency job growth 2016–2019
  - Energy efficiency employment still 11% below 2019 peak
- Energy efficiency businesses in MA: 9,621
  - 63% have fewer than 20 employees

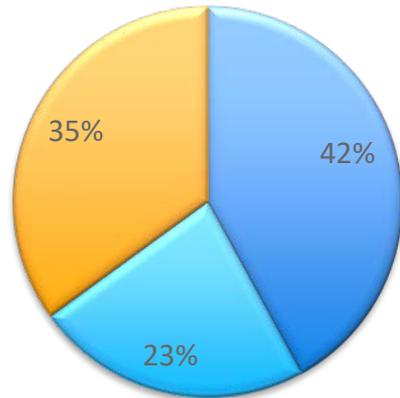
## Local Data

- Energy efficiency workers in Metro Area: 54,814 (Boston-Cambridge-Quincy)
- Energy efficiency workers in Suffolk County: 15,473
- # of workers also available for congressional and state senate districts (see link below)



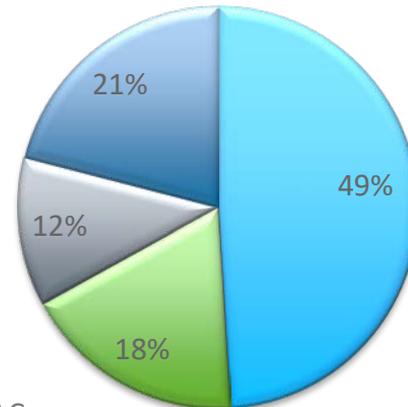
# Employment Breakdown

## MA Energy Efficiency Employment by Industry



- Construction
- Manufacturing and Trade
- Professional and Other Services

## MA Energy Efficiency Employment by Sector



- HVAC
- ENERGY STAR (Appliances & Efficient Lighting)
- Building Materials and Insulation
- Other (includes energy auditors)

# Weatherization Assistance Program

## WAP – Home Energy Performance Wages (2021)

Occupation	MA Avg. Hourly Wage
Retrofit Installer	N/A
Crew Lead	N/A
Energy Auditor	\$28.50
Quality Control Inspector	\$28.00
WAP Manager	\$35.50
Intake Specialist	\$18.00

# Weatherization Assistance Program

- WAP Agencies in MA: [12](#)
- Boston area WAP is provided by:
  - [Action for Boston Community Development, Inc.](#)
- WAP + IREC Accredited Training Center(s) serving MA:
  - [South Middlesex Opportunity Council/Green Jobs Academy](#)  
(Marlborough)



Thank you

[www.nrel.gov](http://www.nrel.gov)

NREL/TP-5500-83857

